

Application No. 10/753,138

Reply to Office Action

**REMARKS/ARGUMENTS***The Pending Claims*

The pending claims are directed to a method of chemical-mechanical polishing of a substrate. Claims 1-3, 6-10, 13-21, and 31-39 are currently pending. Reconsideration of the pending claims is respectfully requested.

*Discussion of the Claim Amendments*

Claim 1 has been amended to recite a method for polishing a substrate comprising a metal in an oxidized form, wherein the metal is a noble metal selected from the group consisting of platinum, iridium, ruthenium, rhodium, palladium, silver, osmium, gold, and combinations thereof, thus incorporating the subject matter of claim 12. Accordingly, claims 4, 5, 11, and 12 have been canceled. Claims 6 and 13 have been amended to correct claim dependencies in view of the cancellation of claims 5 and 12. Claims 3 and 7 have been amended to recite their dependency on claim 1. Support for the amendments to claims 3 and 7 can be found in the instant specification at paragraphs [0015] and [0023], respectively. Claims 22-30 were previously canceled, without prejudice or disclaimer of the subject matter recited therein, as being directed to a nonelected invention in response to a restriction requirement (see "Response and Election" dated January 4, 2005). The cancellation of these claims was in error inasmuch as these claims encompass, or are dependent on claims that encompass, the species selected by Applicants in response to the restriction requirement. These claims are reinstated as claims 31-39, of which claims 36, 38, and 39 additionally recite that the substrate comprises a metal in an oxidized form, wherein the metal is a noble metal selected from the group consisting of platinum, iridium, ruthenium, rhodium, palladium, silver, osmium, gold, and combinations thereof. All of the pending claims encompass the selected species except for claim 31, which is dependent on "generic" claim 1. No new matter has been added by way of these amendments.

*Summary of the Office Action*

The Office Action rejects claims 1-4, 11, 16-18, 20, and 21 under 35 U.S.C. § 102(b) as allegedly anticipated by U.S. Patent Application Publication 2002/0182982 A1 (Li et al.) (hereinafter "the Li '982 publication"). The Office Action also rejects claims 5-10, and 12-15, and 19 under 35 U.S.C. § 103(a) as allegedly unpatentable over the Li '982 publication in view of U.S. Patent Application Publication 2002/0086511 A1 (Hartner et al.) (hereinafter "the Hartner '511 publication") and/or U.S. Patent 6,454,822 (Rosenflanz) (hereinafter "the Rosenflanz '822 patent"). Applicants respectfully traverse the rejections.

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*Discussion of the Anticipation Rejection*

The Li '982 publication does not disclose or suggest a method for polishing a substrate comprising a metal in an oxidized form, wherein the metal is a noble metal selected from the group consisting of platinum, iridium, ruthenium, rhodium, palladium, silver, osmium, gold, and combinations thereof, as recited in the pending claims. The Li '982 publication discloses a method for planarizing a substrate with reduced or minimal residual conductive materials remaining from the polishing process, wherein the residual conductive materials include copper-containing material such as copper, copper alloys, and doped copper, as well as by-products such as copper oxides. The methods of the Li '982 publication can additionally be used to polish and planarize metal layers, including layers comprising copper, copper alloys, doped copper, aluminum, doped aluminum, nickel, doped nickel, tantalum, tantalum nitride, tungsten, tungsten nitride, titanium, titanium nitride, and silicon nitride. As the Office Action acknowledges (Office Action dated February 9, 2005, p. 3, last complete sentence), the Li '982 publication "fails to disclose that the metal may be [a] noble metal."

Since the Li '982 publication fails to disclose each and every element of the pending claims, the anticipation rejection should be withdrawn.

*Discussion of the Obviousness Rejections*

As noted above, the Li '982 publication fails to teach or suggest that the method disclosed therein can be used to polish or planarize a metal in an oxidized form, wherein the metal is a noble metal. As is well-settled, in order to establish a *prima facie* case of obviousness with respect to a claim, at least two criteria must be met: (1) the prior art references must suggest to one of ordinary skill in the art to make the subject matter defined by the claims in issue and (2) the prior art references must provide one of ordinary skill in the art with a reasonable expectation of success in so making the subject matter defined by the claims in issue. Both the suggestion and the reasonable expectation of success must be found in the prior art references, not in the disclosure of the patent application in issue. See, e.g., *In re Vaeck*, 947 F.2d 488, 493, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991). In the present case, the Office Action fails to identify any teaching or suggestion within the cited references or the knowledge generally available to those of ordinary skill in the art that would have motivated the ordinary artisan, at the time of invention, to apply the polishing method disclosed in the Li '982 publication to a substrate comprising a noble metal or an oxidized form thereof. In particular, the Hartner '511 publication and the Rosenflanz '822 patent fail to satisfy the deficiencies of the Li '982 publication.

One of ordinary skill in the art will readily appreciate that noble metals present a particular processing challenge in CMP, as noble metals are mechanically harder and more

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chemically resistant than many of the other integrated circuit conductor metals. Thus, the ordinarily skilled artisan, on being presented with the disclosure of the Li '982 publication, would not be motivated to apply the methods disclosed therein, which are directed to polishing and planarizing metals comprising, *inter alia*, copper, tantalum, and tantalum nitride, to the polishing of layers comprising a noble metal. Nothing within the Hartman '511 publication or the Rosenflanz '822 patent would lead the ordinarily skilled artisan to do so.

The Hartner '511 publication is generally directed to a method for fabricating a patterned layer from a layer material, which method comprises (a) providing a substrate with at least one target region and at least one migration region, (b) applying a layer material, (c) adding a material selected from a recited group, and (d) performing a heat treatment such that the layer material migrates from the migration region to the target region. Although the Hartner '511 publication discloses that the substrate can be obtained by filling recesses on the substrate with a barrier material such as iridium oxide and then carrying out a chemical-mechanical planarization (CMP) step, the Hartner '511 publication is silent as to the details of the CMP step.

The Office Action relies on the Rosenflanz '822 patent for its disclosure that "sol-gel derived  $\alpha$ -alumina particles have a longer abrasive life on metal than conventional alumina particles" (Office Action dated February 9, 2005, p. 4, second sentence from bottom). However, nothing in the Rosenflanz '822 patent discloses or suggests that sol-gel derived  $\alpha$ -alumina particles are particularly suited for use in a CMP method, let alone in a method for polishing a substrate comprising a metal in an oxidized form, wherein the metal is a noble metal. Further, nothing within the Li '982 publication teaches or suggests that alumina is a preferred abrasive, let alone sol-gel  $\alpha$ -alumina. The Office Action has failed to explain why one of ordinary skill in the art, at the time the invention was made, would be motivated to combine the sol-gel derived  $\alpha$ -alumina particles of the Rosenflanz '822 patent with the method disclosed in the Li '982 publication to arrive at the present invention as recited in the pending claims.

The references merely recite individual elements of the claimed method. Given that the Li '982 publication lacks any guidance regarding a method for polishing a substrate comprising a metal in an oxidized form, wherein the metal is a noble metal, that the disclosure of the Hartner '511 publication lacks any teaching or suggestion as to a suitable method for the polishing of such a substrate, and that the Rosenflanz '822 patent lacks any teaching or suggestion that sol-gel derived  $\alpha$ -aluminum particles are useful in a CMP method, one of ordinary skill in the art would not be motivated to combine the cited references, except with the improper hindsight of the present invention.

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Accordingly, the present invention as defined by the pending claims is not obvious in view of the cited references, whether considered individually or together, and the obviousness rejections should be withdrawn.

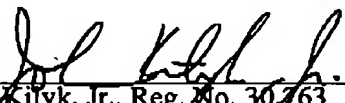
*Information Disclosure Statement*

Applicants submitted an Information Disclosure Statement, along with a PTO-1449 form identifying references AA-AZ, when the subject patent application was filed on January 7, 2004. Applicants request a copy of the Examiner-initialed PTO-1449 form identifying references AA-AZ to confirm the Examiner's consideration of references AA-AZ.

*Conclusion*

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

  
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Amendment or ROA - Regular (Revised 2005 04 13))